ISOASTRAGALIN—A FLAVONOL GLYCOSIDE FROM THE FLOWERS OF GOSSYPIUM HIRSUTUM

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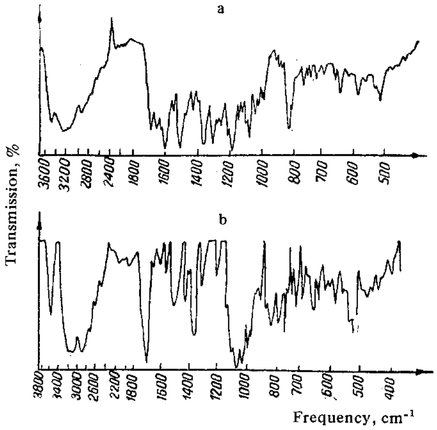
Kaempferol 3-glucoside (astragalin) is found in a considerable number of plants [1–4].

From the flowers of the cotton plant of variety 108-F (G. hirsutum) we have isolated a flavonol glycoside with the composition $C_{21}H_{20}O_{11} \cdot H_2O$, mp 245–246° C (decomp.), R_f 0.85 [butan-1-ol–acetic acid–water (4 : 1 : 5)]; heptaacetate $C_{35}H_{34}O_{18}$ with mp 180–181° C. UV spectra with ionizing and complex-forming salts, λ_{max}, mμ: 320, 265 (C_2H_5OH); 310, 275 (CH_3COOH); 320, 275 (H_3BO_3); 320, 255 ($AlCl_3$); for the IR spectra, see the figure, a.



IR spectrum (a) and differential IR spectrum (b) of isoastragalin.

After acid hydrolysis the glucoside gave glucose and an aglycone with mp 276–278° C, R_f 0.86 (BAW), UV and IR spectra identical with those of kaempferol. The glycoside does not fluoresce in UV light; with zinc and hydrochloric acid it gives a crimson-red color, and with zirconyl chloride it gives no coloration. All these reactions show that the glucose is attached to the kaempferol via the hydroxyl at $C_{(3)}$.

In the differential IR spectrum of the glucoside (figure, b), there are two absorption bands in the 1100–1010 cm^{-1} region at 1075 and 1040 cm^{-1}, which are an indication of the furanose form of the glucose [5]. A band at 840 cm^{-1} shows the α-configuration of the glucosidic bond.

The results obtained permit the structure of kaempferol 3-α-D-glucofuranoside to be proposed for the glycoside.

Indian scientists [6] have previously isolated kaempferol (populnetin) from the flowers of Gossypium barbadense.

This is the first time that a kaempferol glycoside has been isolated from the cotton plant. Since its chemical properties are different from those of astragalin, we have called it "isoastragalin."

EXPERIMENTAL

Isoastragalin. On prolonged standing, the mother liquors remaining after the separation of quercimeritrin [7], quercetin 3'-glucoside, and hirsutrin [9] deposited light yellow crystals of isoastragalin which dissolved comparatively sparingly in ethanol and very readily in acetone.

Found, %: C 54.31; H 5.02. Calculated for $C_{21}H_{20}O \cdot H_2O$, %: C 54.07; H 4.72.

The heptaacetyl derivative was obtained by heating the substance with acetic anhydride and sodium acetate for 1 hr. This derivative formed small light cream-colored needles, mp 180–181° C (from 70% ethanol).

Found, %: C 56.65; H 5.48. Calculated for $C_{35}H_{34}O_{18}$, %: C 56.60; H 4.58.

Hydrolysis. A mixture of 0.2 g of isoastragalin and 2 ml of 5% HCl was heated for 2 hr; the yellow needles of the aglycone with mp 276–278° C (from 70% ethanol) were identical with kaempferol in all properties.

In the mother liquor a sugar having a R_f value identical with that of glucose was found by paper chromatography in the ethyl acetate–pyridine–water (2 : 1 : 2) system.

CONCLUSIONS

A new glucoside, isoastragalin, having the structure of kaempferol 3-α-D-glucofuranoside has been isolated from the flowers of the cotton plant of variety 108-F (G. hirsutum).

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